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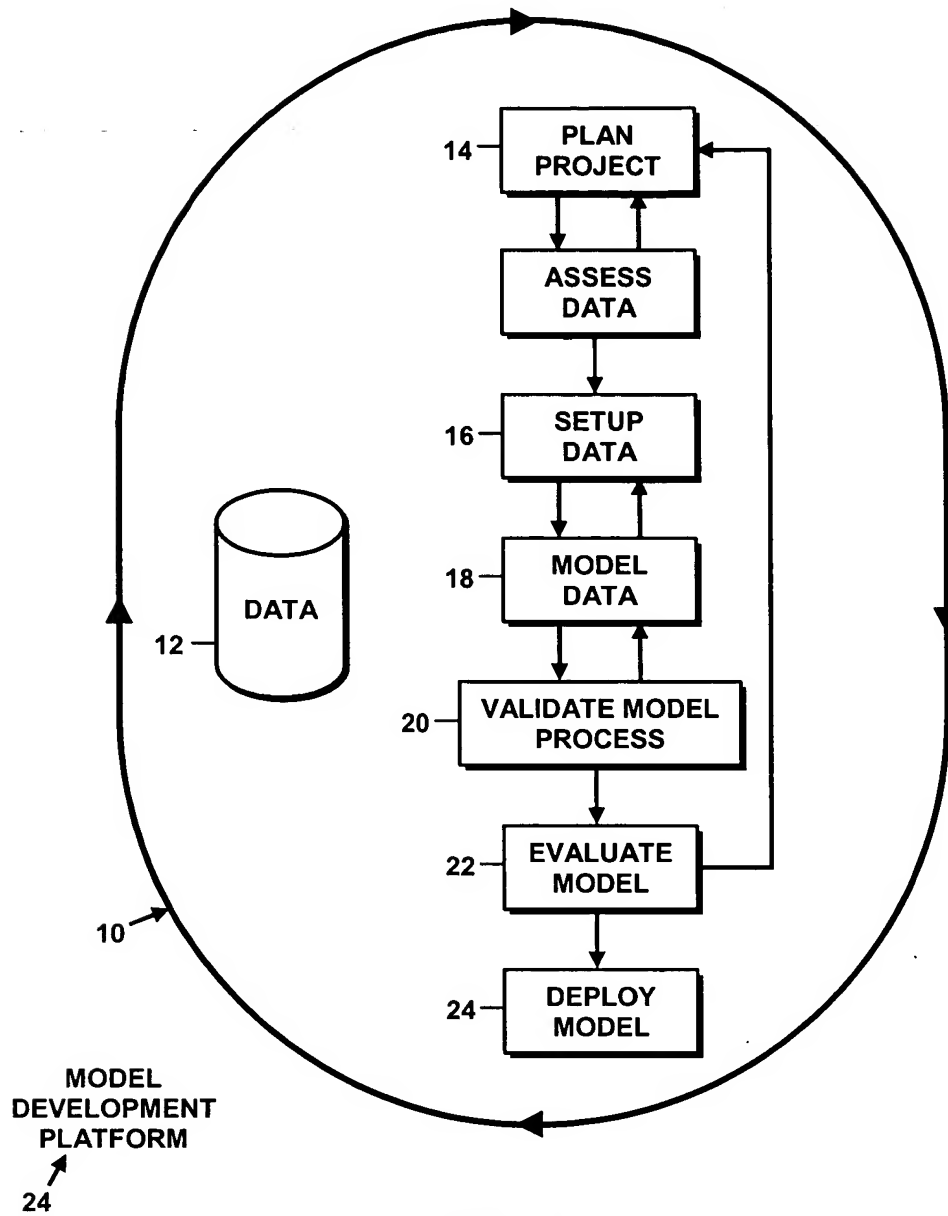
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**FIG. 1**

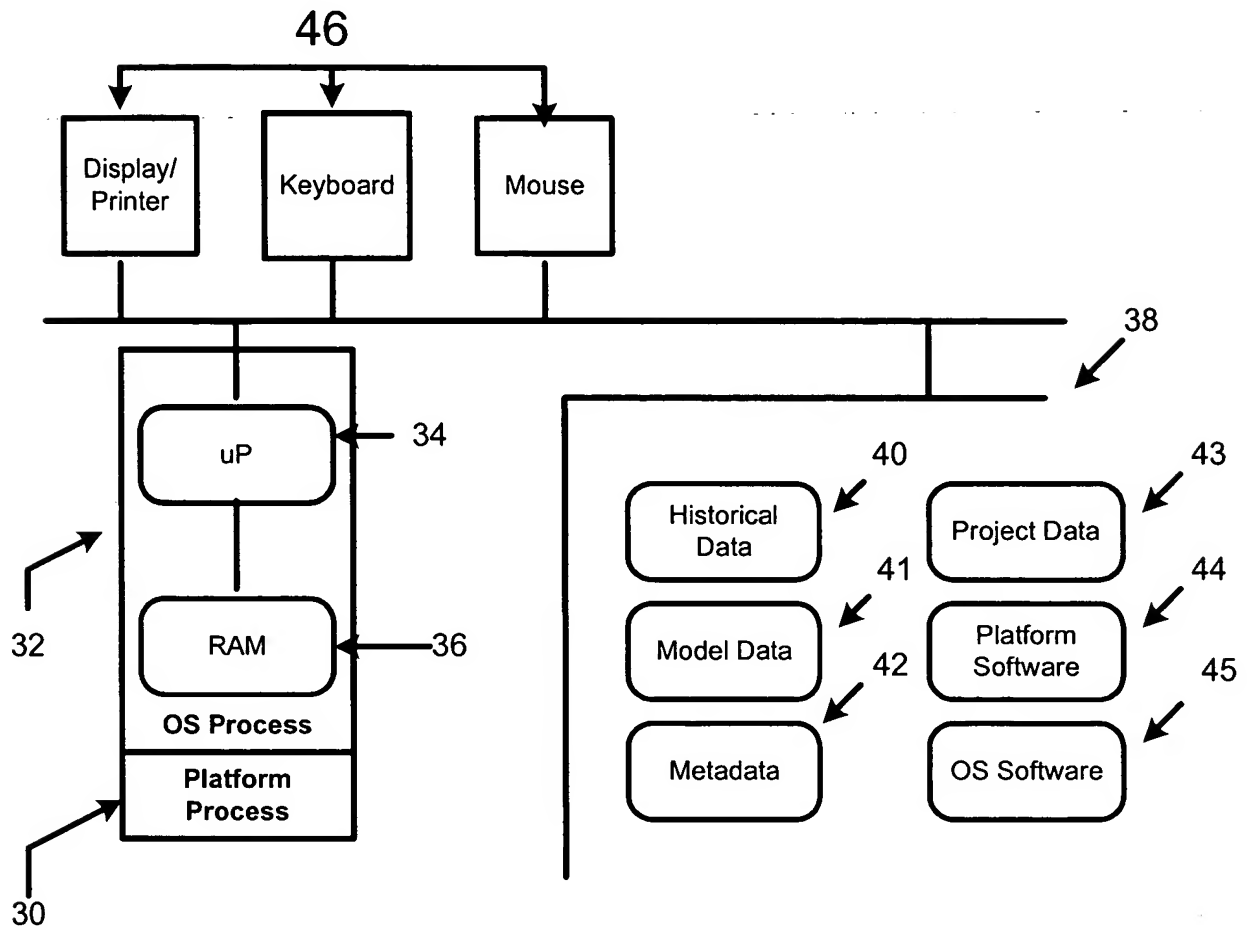


FIGURE 2

Applicant(s): Stephen K. Pinto et al.

## PREDICTIVE MODEL AUGMENTATION BY VARIABLE TRANSFORMATION

50

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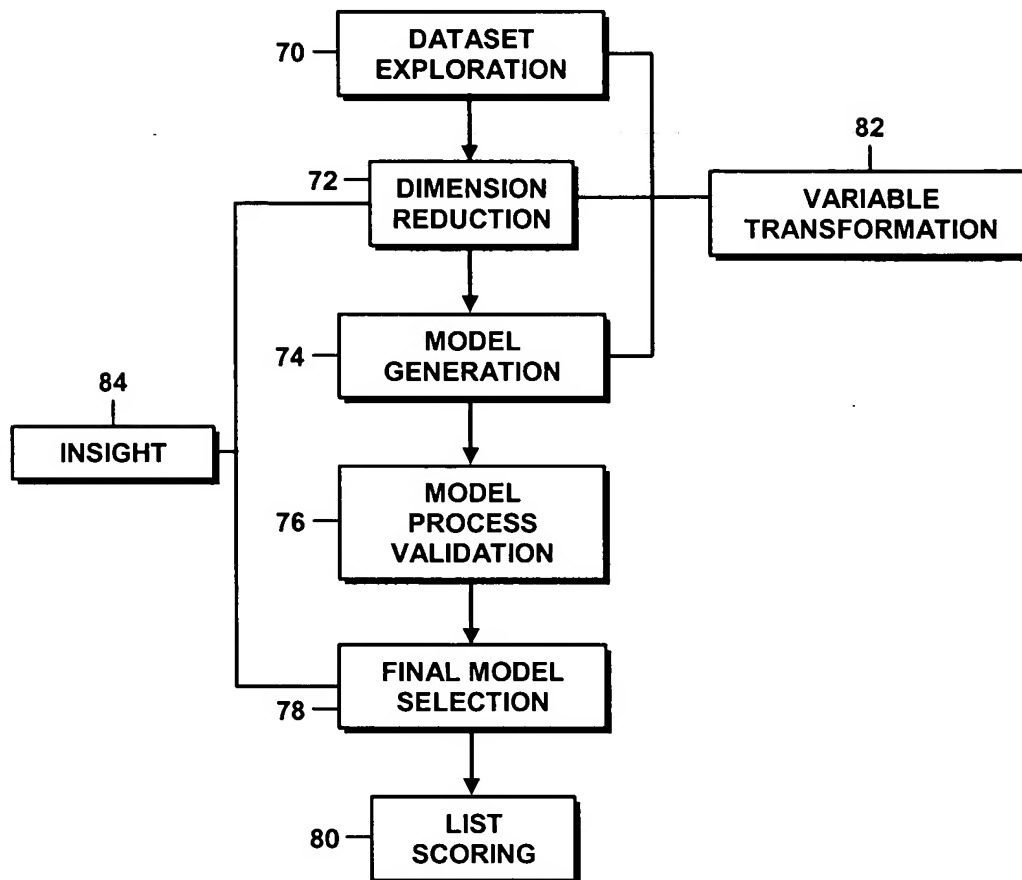
58

60

62

Field Name	Data Type	Description
ProjectID	AutoNumber	Unique Number indexing Model Projects
ProjectName	Text	Reference Name for Model Project
ProjectType	Text	Type of Model to be constructed (Response, Clone, Suppression, ....)
ProjectGoal	Text	Analyst-defined goal for current Model Project
ProjectBeginDate	Date/Time	Identifying Time Stamp for first use
ProjectEndDate	Date/Time	Last used Time Stamp
ProjectDataset	Text	Full pathname reference to Development dataset
ProjectDataDictionary	Text	Full pathname reference to metadata and Model status and data
ProjectLog	Text	Full pathname reference to log of Analyst decisions
DependentVariable	Text	Target variable selected for Model
ModelFitnessCriterion	Number	Desired c-index for Model set by Analyst
ModelPerformanceCriterion	Number	Desired zone of positive Model Gain set by Client
ModelPerformanceMonotonicityCriterion	Number	Desired level of Monotonicity
DevelopmentDatasetSize	Number	Total number of records in Development Dataset
PositiveOutcomes(%)	Number	Number of successful outcomes as a percent of Development Dataset Size
SampleSize(%)	Number	Size of Training Sample as a percent of total Development Dataset Size used for Candidate Model
VariableCount	Number	Initial Number of Predictor Variables
SampleDistribution	Hyperlink	Distribution of Predictor Variables: Graphs and Statistics
SampleByDistribution	Hyperlink	Distribution of Predictor Variables for Positive and Negative Outcomes
Interaction Tree	Hyperlink	Cross-validated Partition Tree for Key Predictor Variables
DimensionReductionMissingFilter	Number	Number of Predictor Variables Eliminated for Missing Variables
DimensionReductionCutoff	Number	Cutoff set by Analyst for Percent of Missing Values Acceptable
DimensionReductionMainEffects	Number	Number of Predictor Variables Retained for Main Effects
DimensionReductionMainEffectsCutoff	Number	Cutoff set by Analyst for Significance of Main Effects
DimensionReductionInteractionEffects	Number	Number of Predictor Variables Retained for Interaction Effects
DimensionReductionInteractionEffectsCutoff	Number	Cutoff set by Analyst for Significance of Interaction Effects
DimensionReductionVariableCount	Number	Number of Predictor Variables resulting from Dimension Reduction
CandidateModelChoice	Text	Model Type applied to Dimension Reduced Dataset
CandidateModelChoiceConstraint	Number	Retention Cutoff or Significance Level for Model Variables
CandidateModelResults	Hyperlink	Model Fitting Results
CandidateModelLiftChart	Hyperlink	Model Non-cumulative Lift Chart
CandidateModelPersistenceChart	Hyperlink	Model Persistence Chart for Key Variables
ValidationMethod	Text	Method Selected for Model Development Process Validation
ValidationMethodResults	Hyperlink	Model Application to Validation Dataset(s) Results
ValidationMethodLiftChart	Hyperlink	Model Validation Lift Chart
FinalModelResults	Hyperlink	Model Development Process applied to Full Development Dataset Results
FinalModelLiftChartComparison	Hyperlink	Final Model applied to Sample and Validation Datasets for Cumulative Lift
FinalModelNonCumulativeLiftChartComparison	Hyperlink	Final Model applied to Sample and Validation Datasets for Non-cumulative Lift
FinalModelEquation	Text	Model Parameterized Equation using Model Transformed Variables
ScoringDataset	Text	Full pathname reference to Scoring File Input Dataset
DevelopmentScoringComparison	Hyperlink	Key Variable Comparison on Decile Basis
DevelopmentScoringDistributionComparison	Hyperlink	Propensity Score Distribution for Development and Scoring File (Subset)
ScoringResults	Text	Full pathname reference to Scoring File Output Dataset
InsightProfileMethod	Text	Method for Ranking Customer Insight Variables
InsightProfile	Hyperlink	Ranked List of Key Variables
InsightProfileChart	Hyperlink	Insight Chart of Key Variable Differential Contribution
FinalReportEntry	Memo	Final Report Description and Comments

FIGURE 3

**FIG. 4**

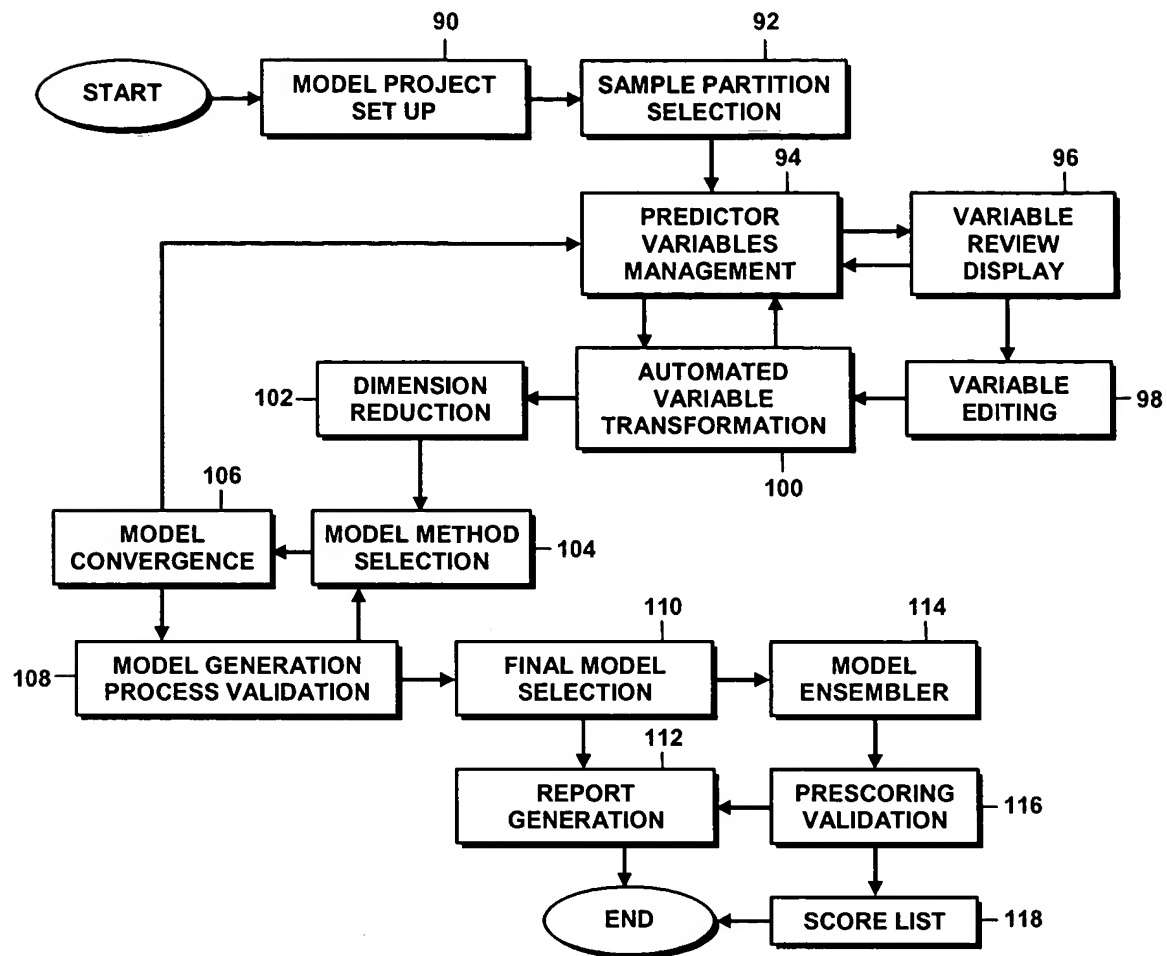
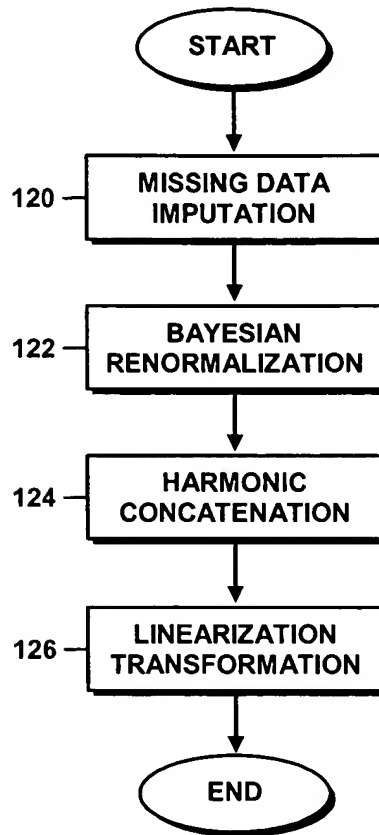
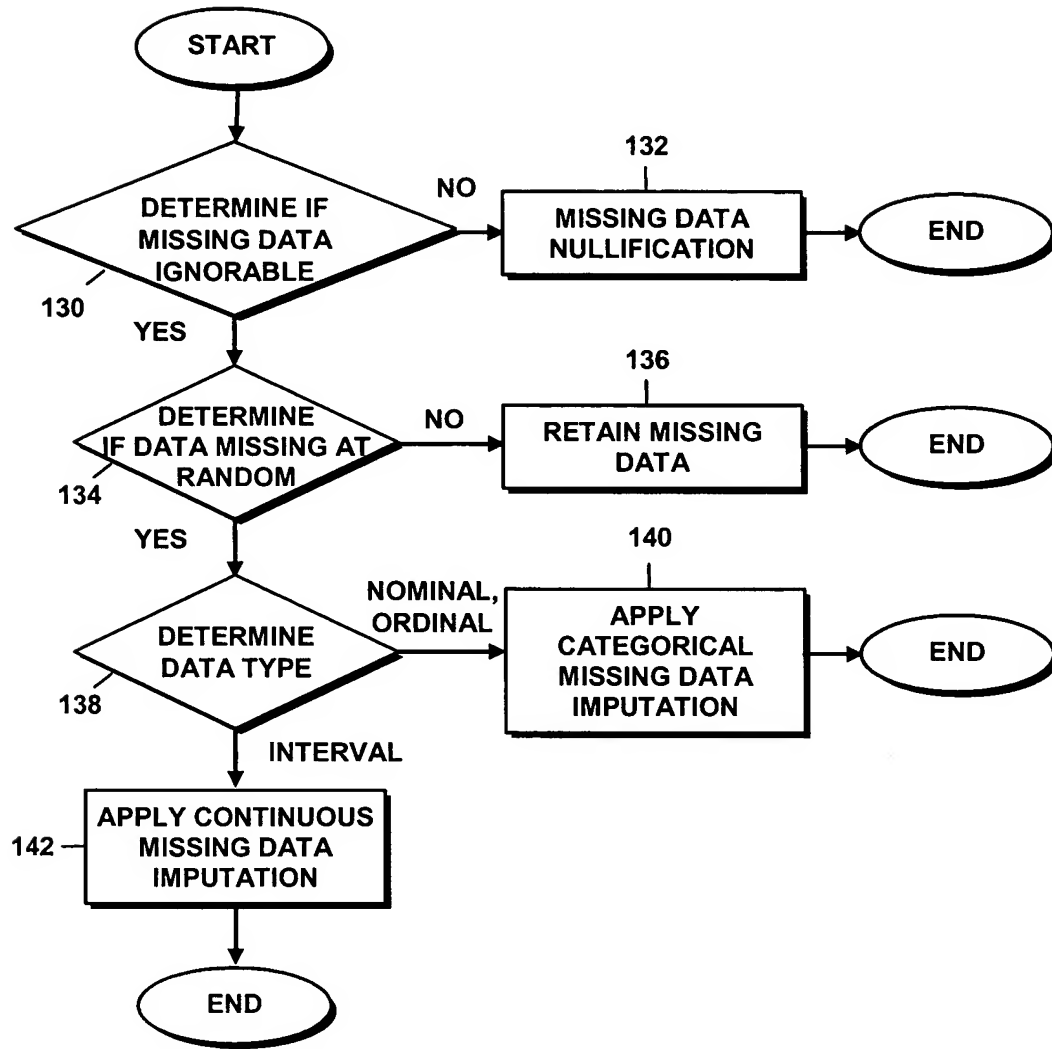
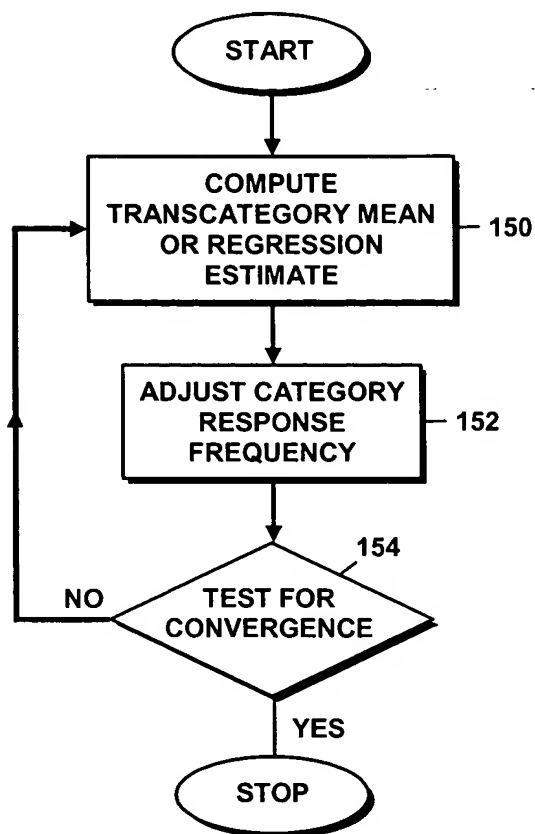


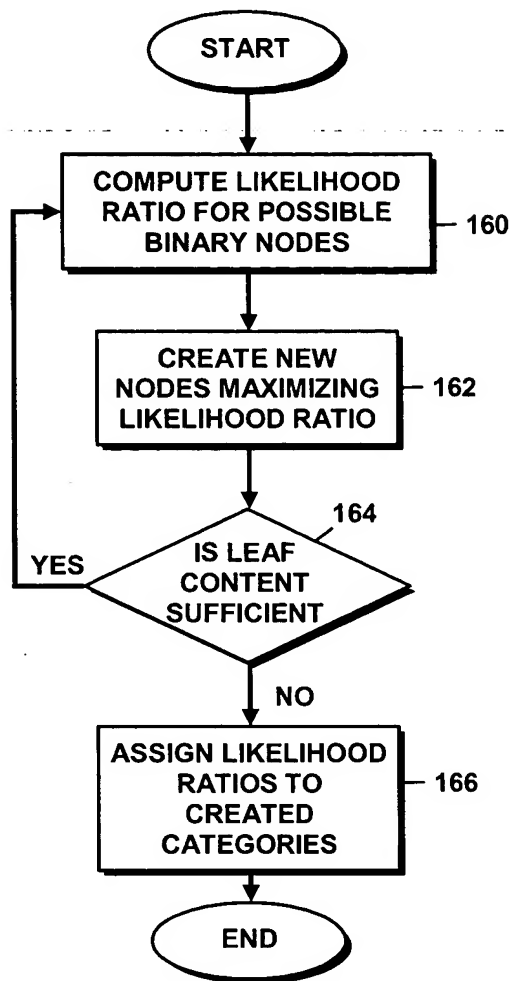
FIG. 5

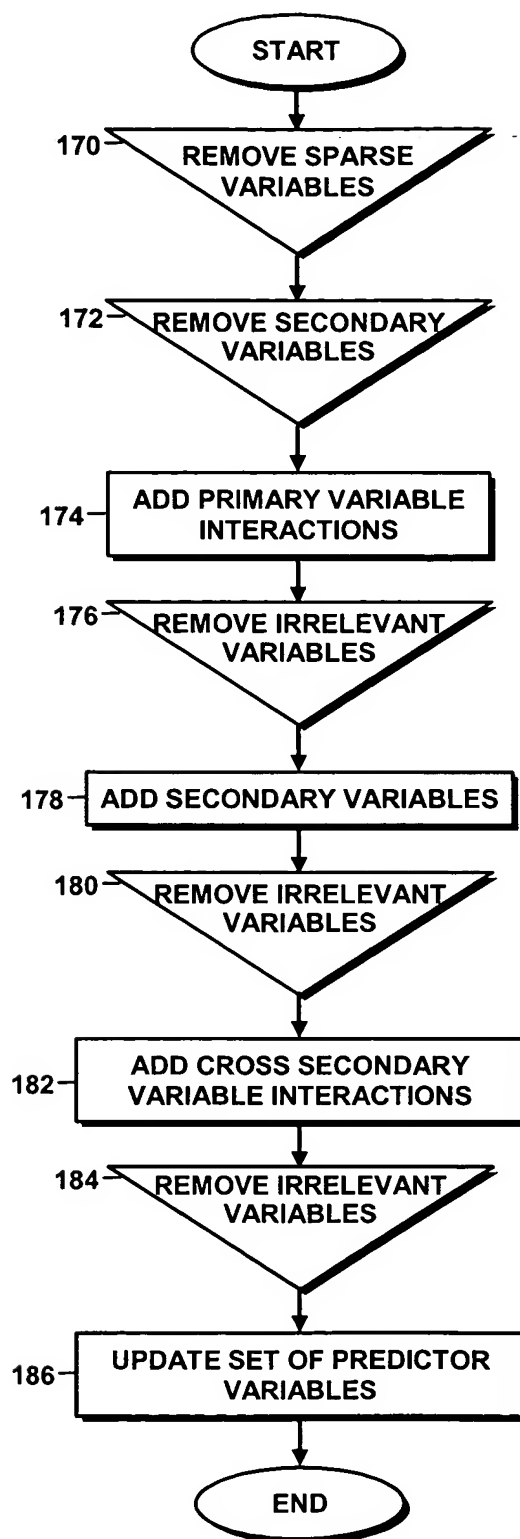
**FIG. 6**

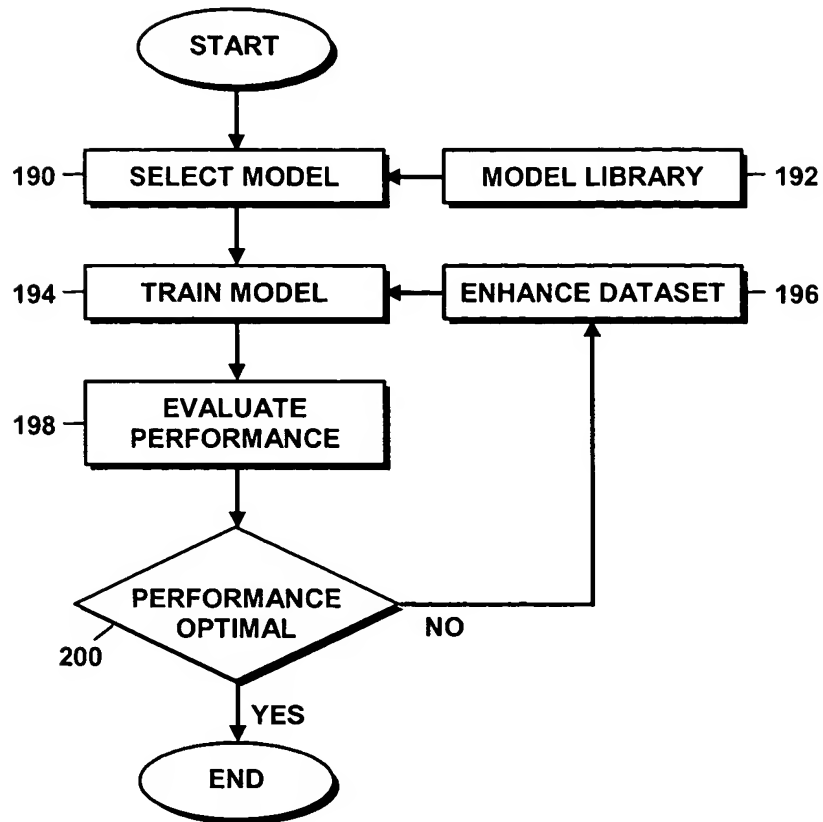
**FIG. 7**

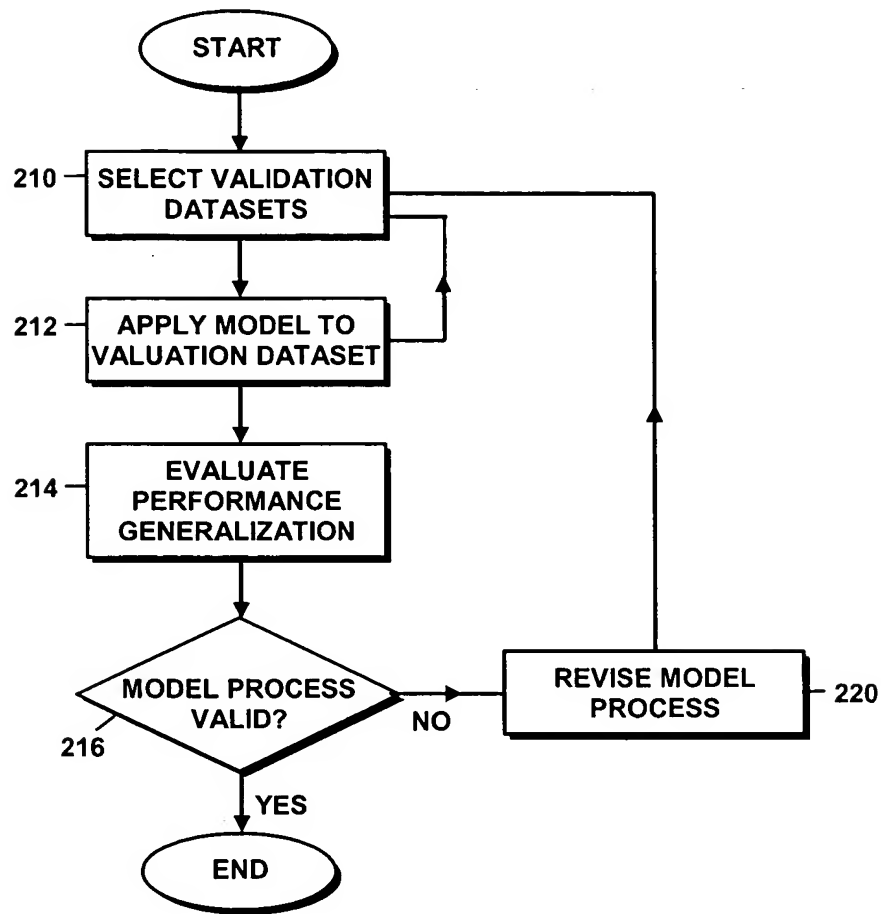


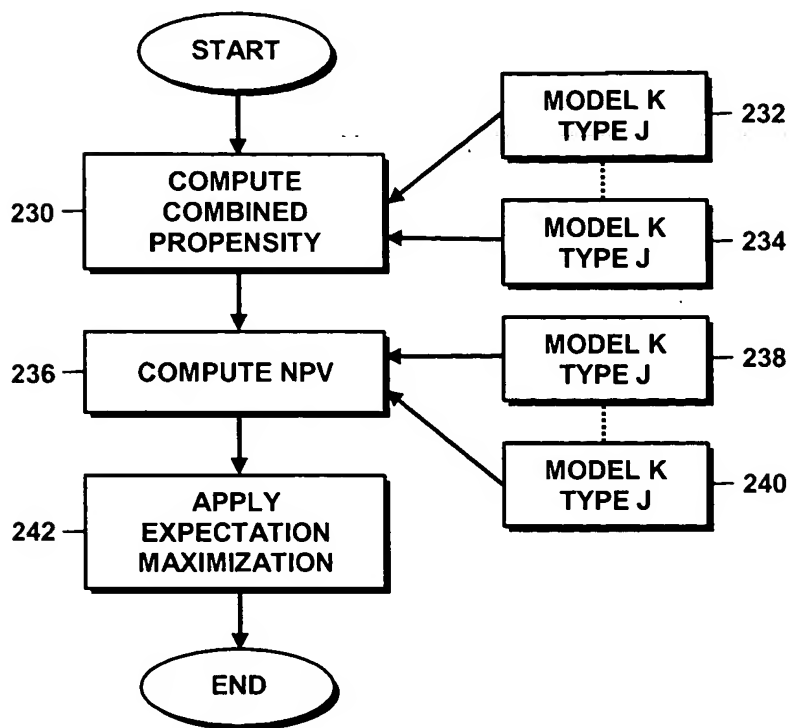
**FIG. 8**

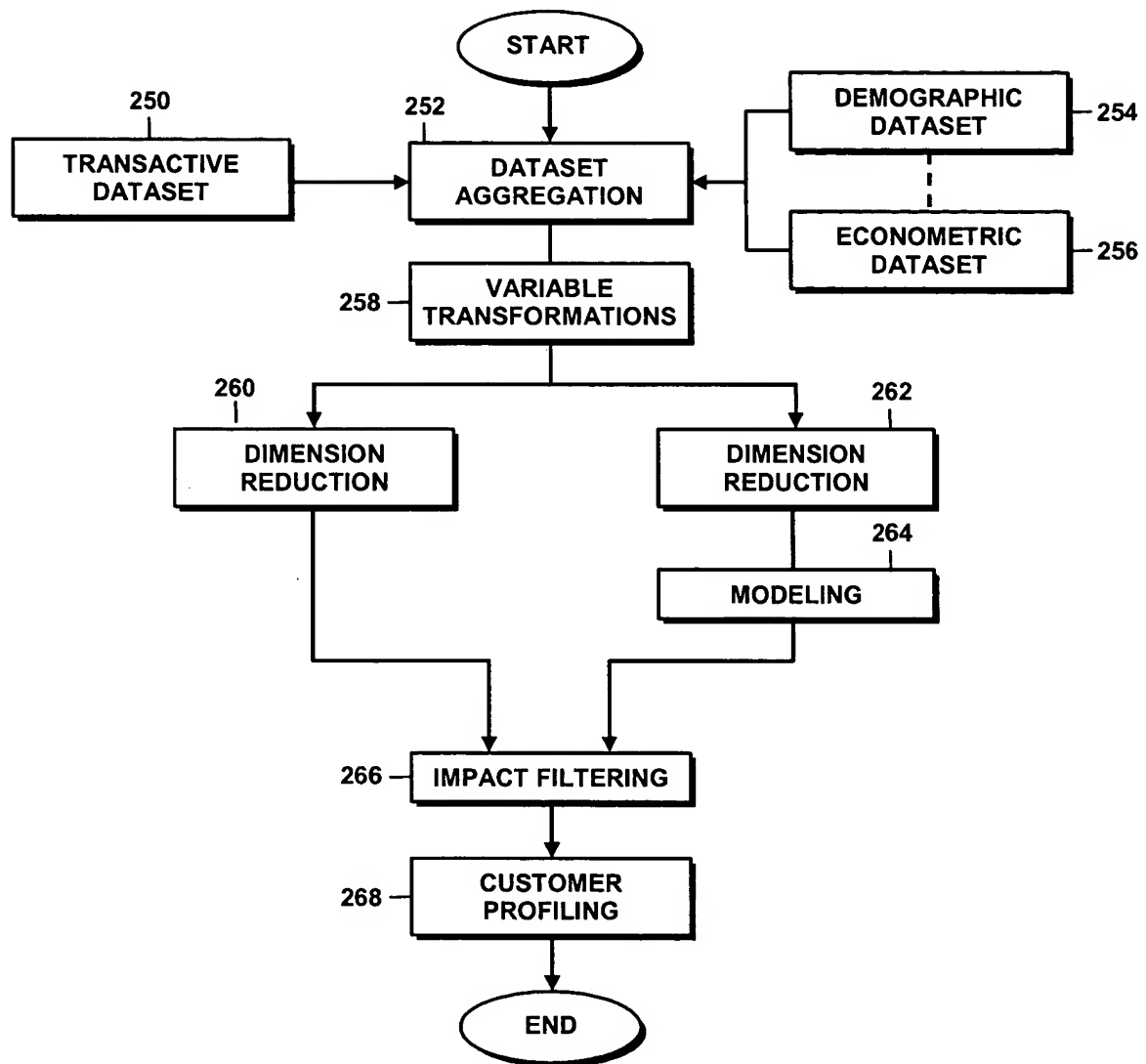
**FIG. 9**

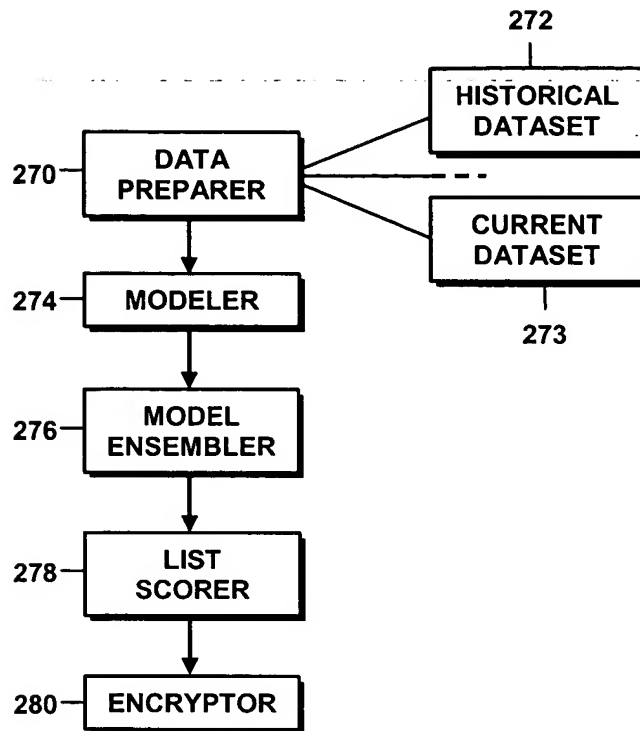
**FIG. 10**

**FIG. 11**

**FIG. 12**

**FIG. 13**

**FIG. 14**

**FIG. 15**



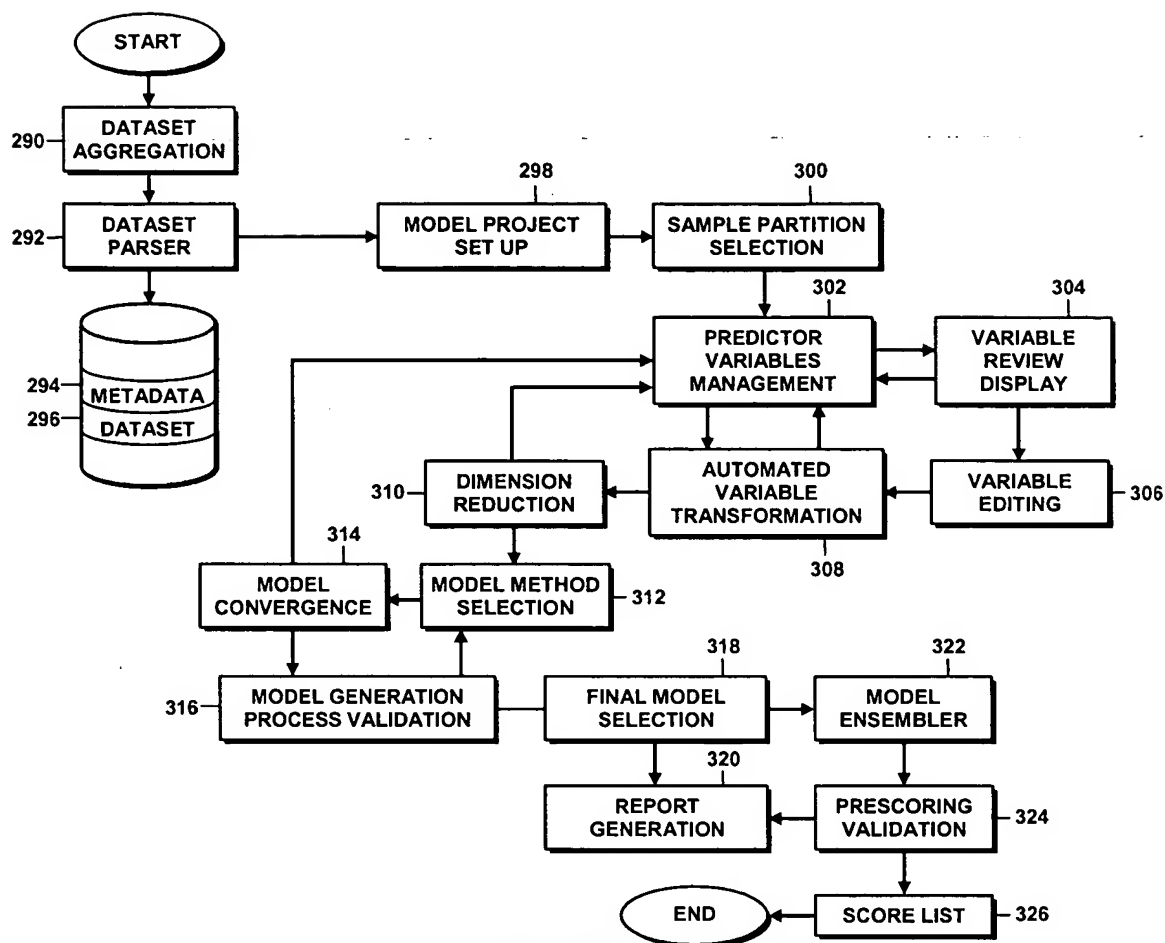


FIG. 16

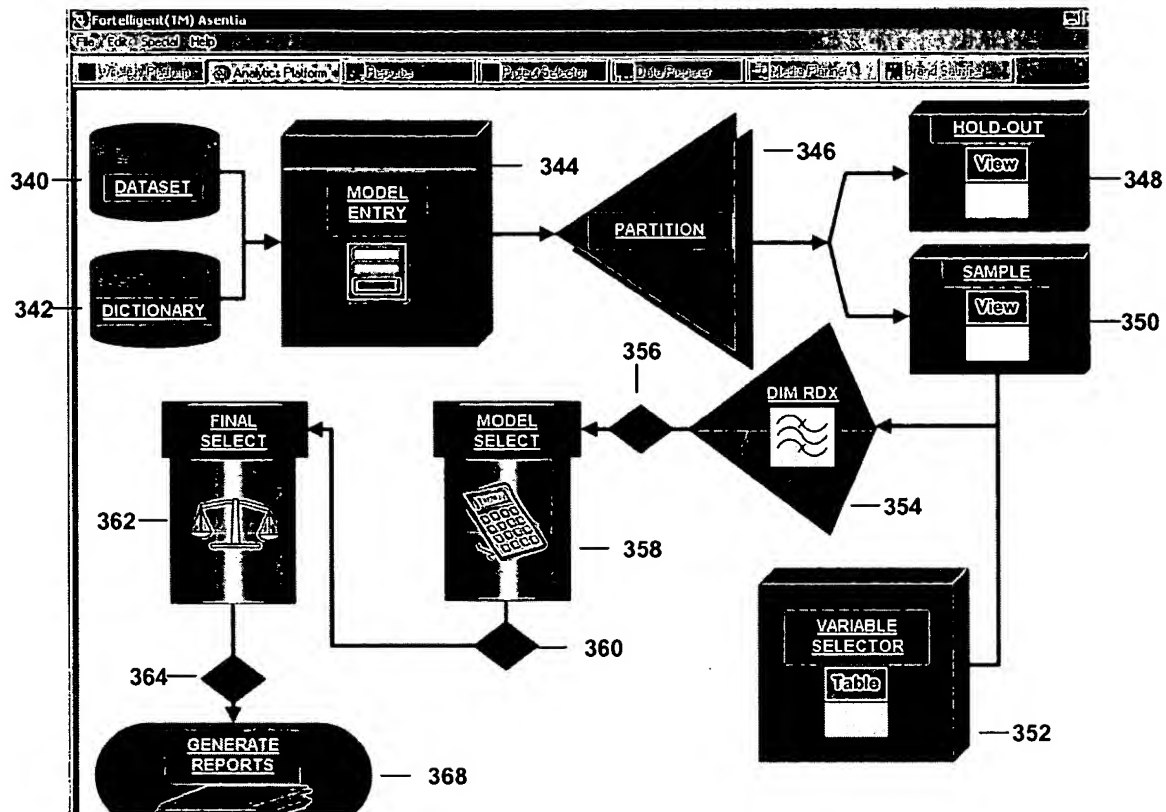


FIG. 17

Applicant(s): Stephen K. Pinto et al.

## PREDICTIVE MODEL AUGMENTATION BY VARIABLE TRANSFORMATION

**Model Project Entry Form**

Model Name: **cme\_Industries\_Marketing\_Model\_7\_03** Model Type: **Contact\_Suppression**

Model Project Goal or Scope: **Identify Optimal Prospects in Repeat Campaign**

370 Browse Datasource: **C:\TEMP\marketingdata.TXT**

372 Browse Dictionary: **C:\TEMP\DataDictionary1.mdb**

Dependent Variable (Y): **Current\_purchase** 374

Candidate Model Properties:

Success criterion (c >): **0.70**

Success criterion (KS >): **0.25**

Model Constraints:

Penetration Depth (%): **40**

☒ Monotone Lift Required

☒ Impute Missing Values

Model Regressor Variables

Variable	Variable Description
CustomerID	Identification Number for Customer
▶ <b>Current_purchase</b>	<b>Made a purchase in current campaign</b>
Recent_purchase	Recently purchased
Recently_contacted	Contacted within last 8 months
Very_recently_contacted	Contacted within last 30 days
Prior_contact_before_purchase1	Contacted before purchase of first kind
Prior_contact_before_purchase2	Contacted before purchase of second kind
Prior_purchase1	Purchase of first kind in recent campaign
Prior_purchase2	Purchase of second kind in recent campaign
No_recent_purchase1	No purchase of first kind in recent campaign
Regional_group1	located in Zone 1

376 **Submit**

FIG. 18A

DataDictionary: Table				
Variable	Variable Type	Variable Description	Variable Definition	Status
▶ CustomerID	N	Identification Number for Customer	CustomerID	XP
Current_purchase	N	Made a purchase in current campaign	Current_purchase	P
Recent_purchase	N	Recently purchased	Recent_purchase	P
Recently_contacted	N	Contacted within last 8 months	Recently_contacted	P
Very_recently_contacted	N	Contacted within last 30 days	Very_recently_contacted	P

FIG. 18B

**Predictor Variables Palette**

Excluded Constructed Variables

Predictor Variables

Excluded Primary Variables

Recent\_purchase  
Recently\_contacted  
Prior\_contact\_before\_purchase  
Prior\_contact\_before\_purchase  
Prior\_purchase1  
Prior\_purchase2  
No\_recent\_purchase1  
Regional\_group6

CustomerID  
Current\_purchase  
Very\_recently\_contacted  
Regional\_group1  
Regional\_group2  
Regional\_group3  
Regional\_group4  
Regional\_group5

Variable Editor

Variable	Definition
Recent_purchase	Recent_purchase
Recently purchased	
Description	
Edit	Save
Clear	Log
	Square
	SQRT
	(X)
	If anyxb
Analyze Predictor Variables	Miss
	Option
	Sum
	Spline
	Aggregate

☒ Interaction Tree: Buyers vs. Non-buyers

Reduce Dimensions

Reconsider Model

FIG. 19.

Applicant(s): Stephen K. Pinto et al.

## PREDICTIVE MODEL AUGMENTATION BY VARIABLE TRANSFORMATION

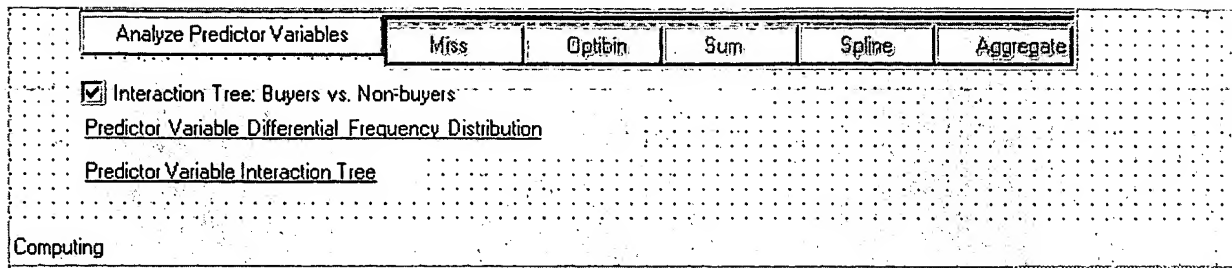


FIG. 20A

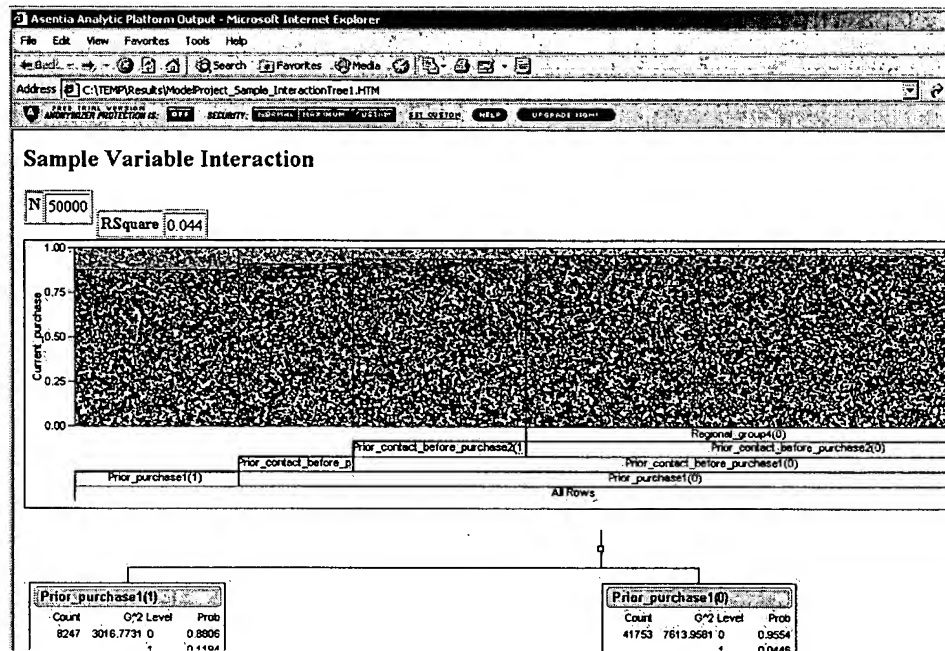


FIG. 20B

Variable Editor	
Variable	Definition
Recent_purchase	Recent_purchase
Description	
Recently purchased	
<div>Edit</div> <div>Save</div> <div>Clear</div>	<div>Log</div> <div>Square</div> <div>SQRT</div> <div>(X)</div> <div>If a &lt; x...</div>
<div>Miss</div> <div>Optibin</div> <div>Sum</div>	

FIG. 21A

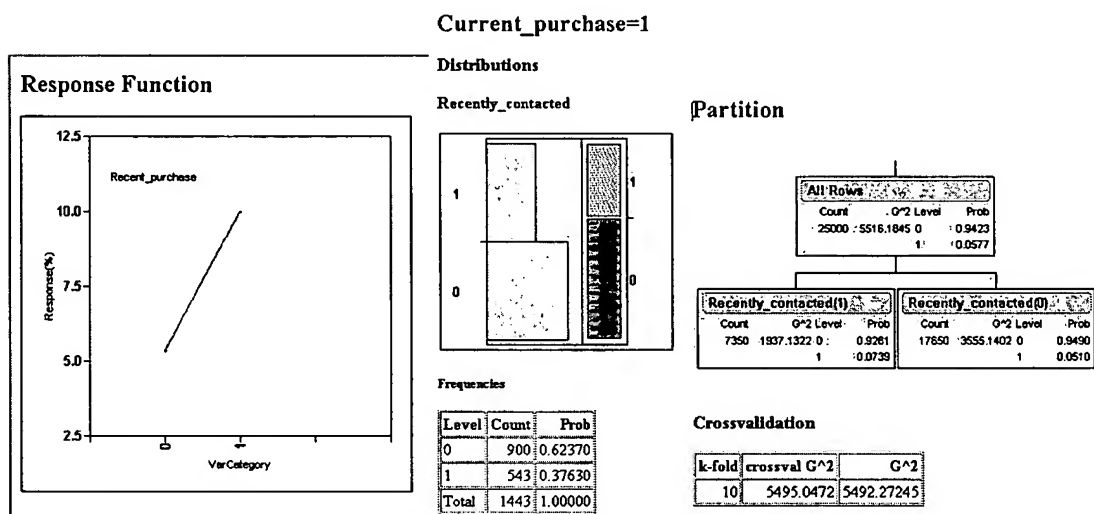


FIG. 21B

Variable Editor	
Variable	Definition
Prior_purchase1_1	Prior_purchase1*
Description	
Purchase of first kind in recent campaign	
<div>Edit</div> <div>Save</div> <div>Clear</div>	<div>Log</div> <div>Square</div> <div>SQRT</div> <div>(X)</div>

FIG. 21C

Variable Editor	
Variable	Definition
Prior_purchase1_I	Prior_purchase1 * Prior_contact_before_purchase1
Description	
Purchase of first kind in recent campaign AND Contacted before purchase of first kind	
<div>Edit Save Clear Log Square SQRT (X)</div>	

FIG. 21D

>

<

regional\_group4  
Regional\_group5  
Regional\_group6  
Prior\_purchase1\_I

<

>

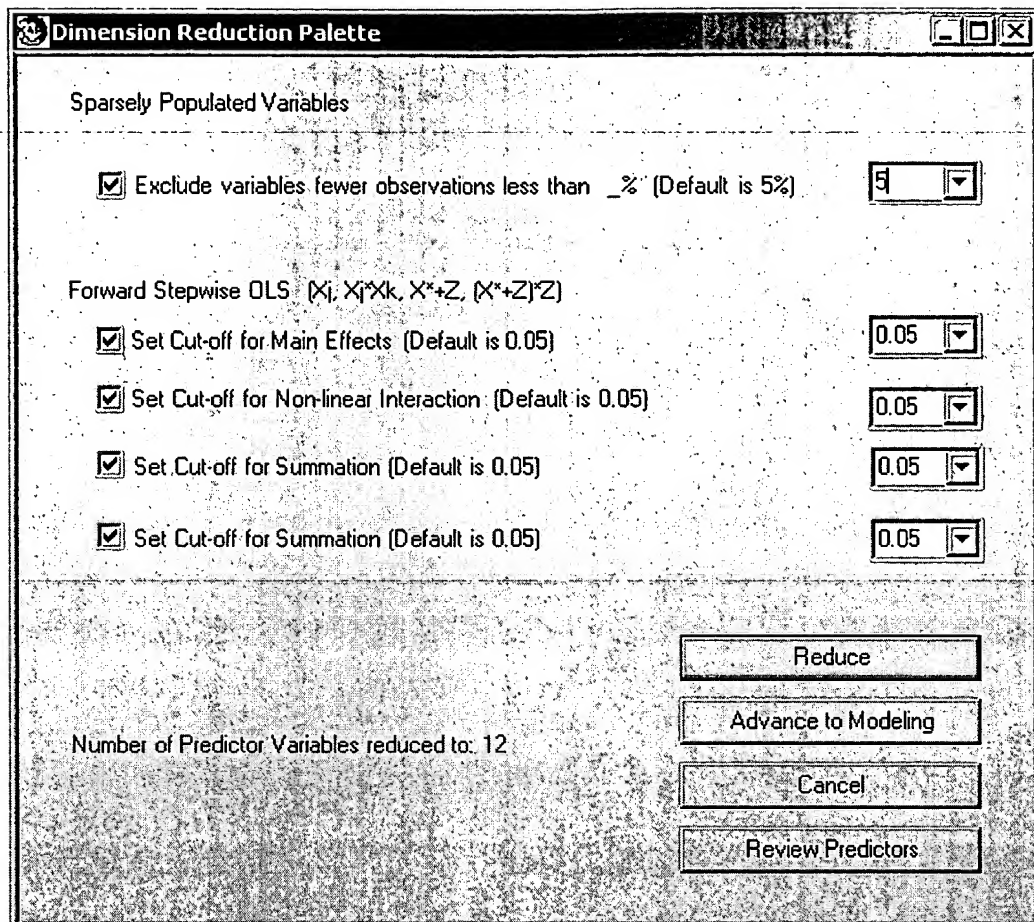
Variable Editor

Variable	Definition
Prior_purchase1_I	Prior_purchase1 * Prior_contact_before_purchase1
Description	
Purchase of first kind in recent campaign AND Contacted before purchase of first kind	
<div>Edit Save Clear Log Square SQRT (X)</div>	

Revisit Reduction

Cancel

FIG. 21E



**Dimension Reduction Palette**

Sparsely Populated Variables

☒ Exclude variables fewer observations less than  % (Default is 5%)

Forward Stepwise OLS  $X_i, X_i \times X_k, X^*+Z, (X^*+Z)^*Z$

☒ Set Cut-off for Main Effects (Default is 0.05)

☒ Set Cut-off for Non-linear Interaction (Default is 0.05)

☒ Set Cut-off for Summation (Default is 0.05)

☒ Set Cut-off for Summation (Default is 0.05)

Number of Predictor Variables reduced to: 12

Reduce

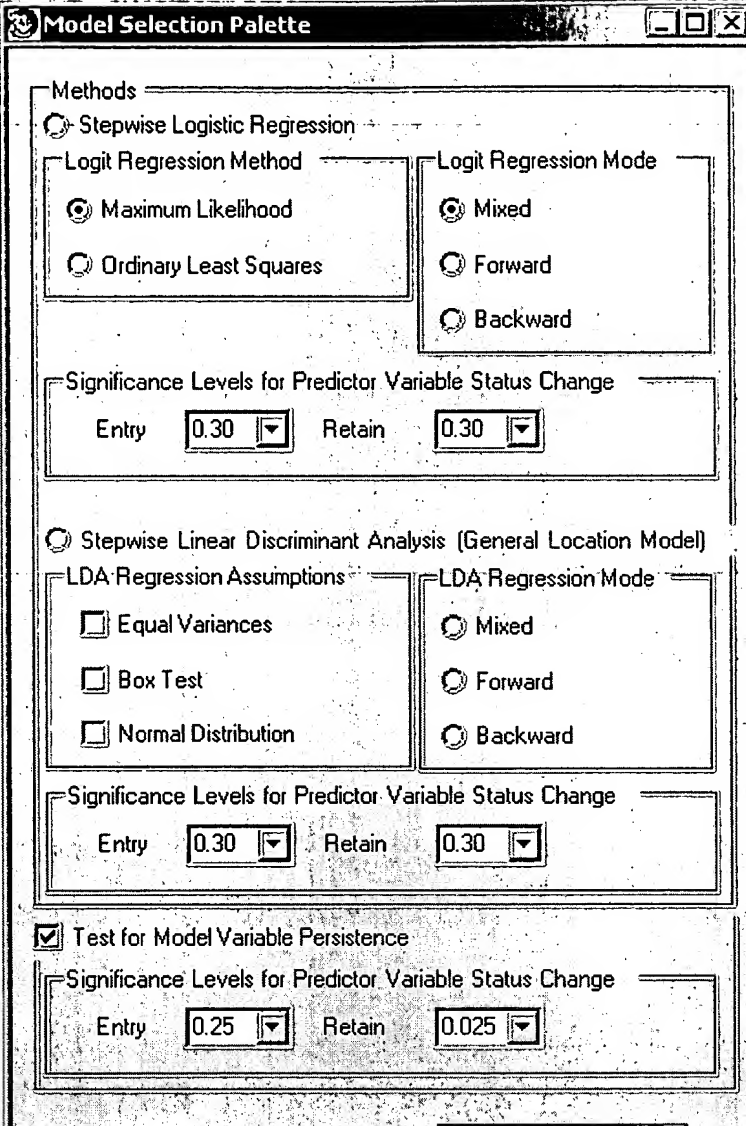
Advance to Modeling

Cancel

Review Predictors

FIG. 22





The image shows a software dialog box titled "Model Selection Palette". It contains three main sections for different statistical methods. The first section, "Stepwise Logistic Regression", has a "Logit Regression Method" group with "Maximum Likelihood" selected and "Ordinary Least Squares" unselected. The "Logit Regression Mode" group has "Mixed" selected, with "Forward" and "Backward" unselected. Below this is a "Significance Levels for Predictor Variable Status Change" group with "Entry" and "Retain" both set to 0.30. The second section, "Stepwise Linear Discriminant Analysis (General Location Model)", has an "LDA Regression Assumptions" group with "Equal Variances", "Box Test", and "Normal Distribution" all unselected. The "LDA Regression Mode" group has "Mixed", "Forward", and "Backward" all unselected. Below this is another "Significance Levels for Predictor Variable Status Change" group with "Entry" and "Retain" both set to 0.30. The third section, "Test for Model Variable Persistence", is checked. Below it is a "Significance Levels for Predictor Variable Status Change" group with "Entry" set to 0.25 and "Retain" set to 0.025.

**Model Selection Palette**

**Methods**

☒ Stepwise Logistic Regression

Logit Regression Method

☒ Maximum Likelihood

☐ Ordinary Least Squares

Logit Regression Mode

☒ Mixed

☐ Forward

☐ Backward

Significance Levels for Predictor Variable Status Change

Entry: 0.30 Retain: 0.30

☐ Stepwise Linear Discriminant Analysis (General Location Model)

LDA Regression Assumptions

☐ Equal Variances

☐ Box Test

☐ Normal Distribution

LDA Regression Mode

☐ Mixed

☐ Forward

☐ Backward

Significance Levels for Predictor Variable Status Change

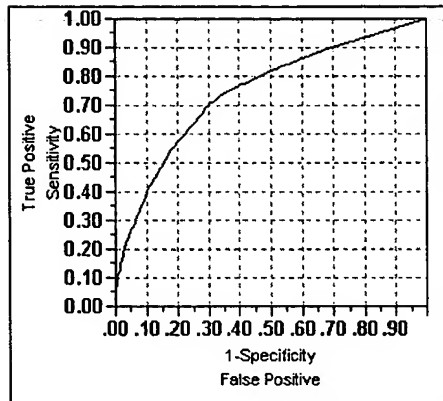
Entry: 0.30 Retain: 0.30

☒ Test for Model Variable Persistence

Significance Levels for Predictor Variable Status Change

Entry: 0.25 Retain: 0.025

FIG. 23A

**Receiver Operating Characteristic**

Using Current\_Purchase='1' to be the positive level  
Area Under Curve =  
0.74906

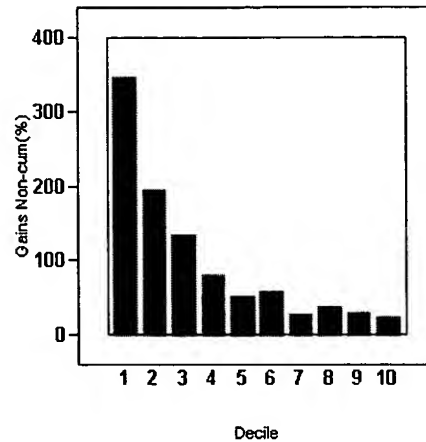
**Model Gains for Sample**

FIG. 23B

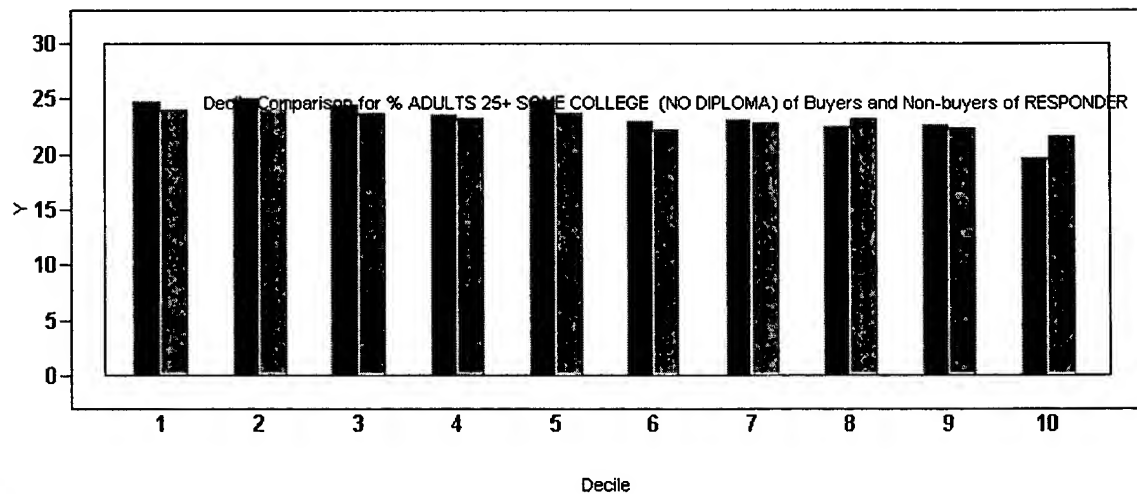
**Persistence of Model for Key Predictor Variables**

FIG. 23C

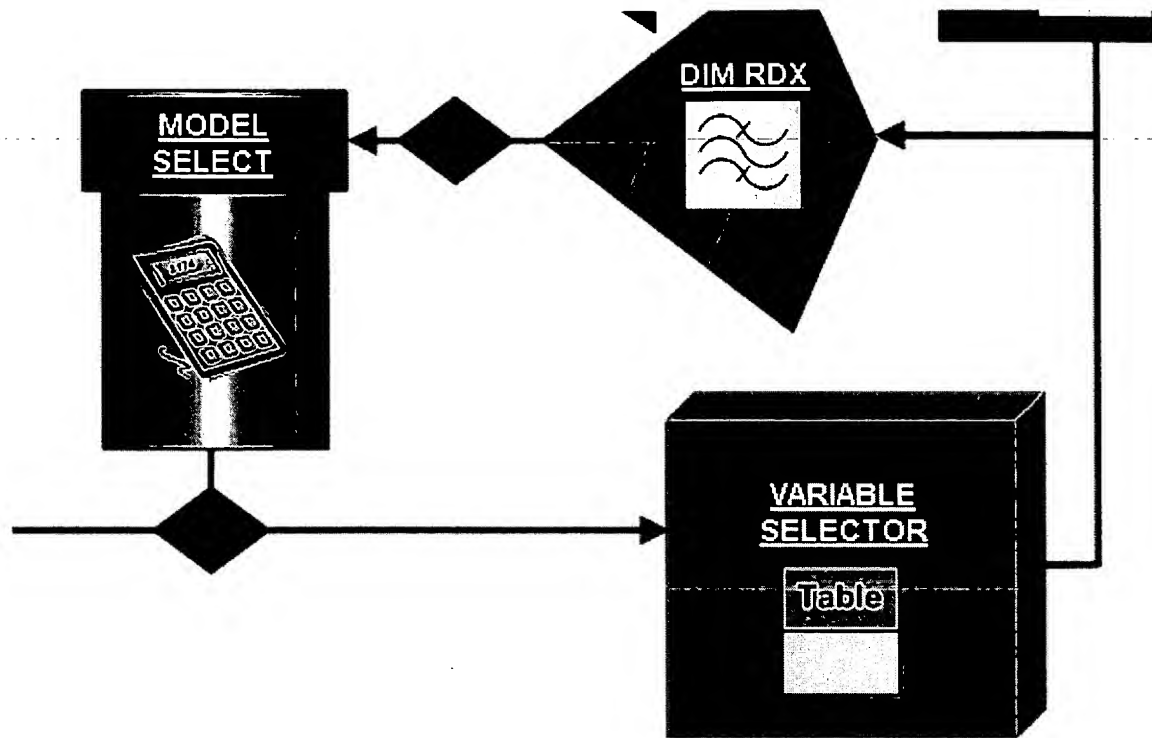


FIG. 24

Applicant(s): Stephen K. Pinto et al.

PREDICTIVE MODEL AUGMENTATION BY VARIABLE  
TRANSFORMATION

**Final Model Candidate Selection**

Target Goals for Final Model

Model Project Target c-Statistic: 0.70  
Model Project Target KS-Statistic: 0.25  
Model Project Anticipated Penetration Depth: 40  
Model Project Monotone Lift Expected: Yes

Select Validation Dataset

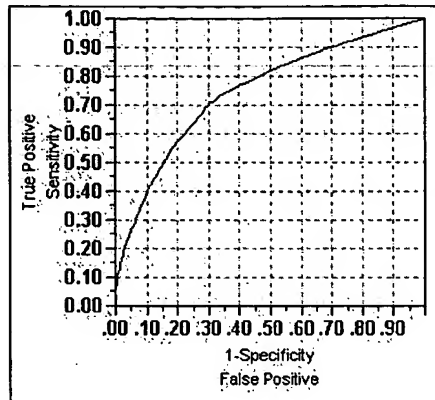
☐ Preselected Sample  
☐ Preselected Sample Complement  
☐ Full Development Dataset (100%)  
☒ Random Sample (%) 0

☒ Model Statistics for Sample vs Validation  
☒ Cumulative Lift of Model versus Baseline  
☒ Non-Cumulative Lift of Model versus Baseline

Validate Model  
Finish Modeling  
Reconsider Model  
Review Predictors

FIG. 25A

Applicant(s): Stephen K. Pinto et al.

PREDICTIVE MODEL AUGMENTATION BY VARIABLE  
TRANSFORMATION**Receiver Operating Characteristic**

Using Current\_Purchase='1' to be the positive level

Area Under Curve =

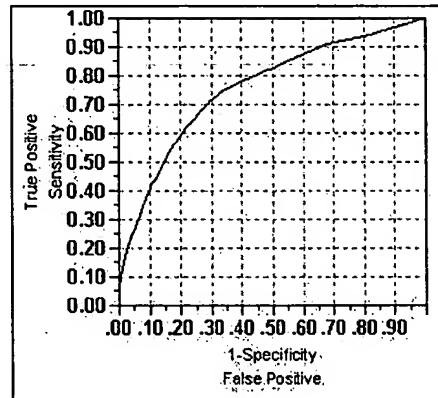
0.74906

FIG. 25B

Applicant(s): Stephen K. Pinto et al.

PREDICTIVE MODEL AUGMENTATION BY VARIABLE  
TRANSFORMATION

## Receiver Operating Characteristic



Using Current\_Purchase = '1' to be the positive level

Area Under Curve =

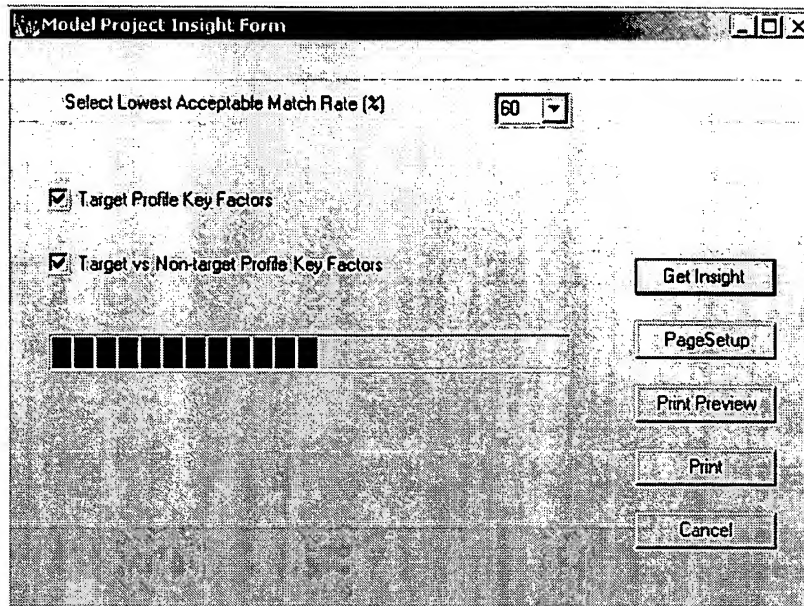
0.75884

FIG. 25C

Applicant(s): Stephen K. Pinto et al.  
PREDICTIVE MODEL AUGMENTATION BY VARIABLE  
TRANSFORMATION

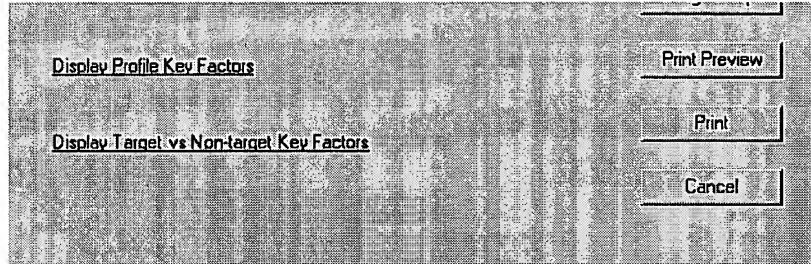


FIG. 26



The image shows a software window titled "Model Project Insight Form". At the top, there is a label "Select Lowest Acceptable Match Rate (%)" followed by a dropdown menu showing the value "60". Below this, there are two checked checkboxes: "Target Profile Key Factors" and "Target vs. Non-target Profile Key Factors". Under the second checkbox is a horizontal bar chart consisting of ten black rectangular segments of varying heights. On the right side of the window, there is a vertical stack of five buttons: "Get Insight", "PageSetup", "Print Preview", "Print", and "Cancel".

FIG. 27A



The image shows a software window with two sections. The first section is titled "Display Profile Key Factors" and contains a horizontal bar chart with ten black rectangular segments of varying heights. The second section is titled "Display Target vs Non-target Key Factors" and also contains a horizontal bar chart with ten black rectangular segments of varying heights. On the right side of the window, there is a vertical stack of three buttons: "Print Preview", "Print", and "Cancel".

FIG. 27B



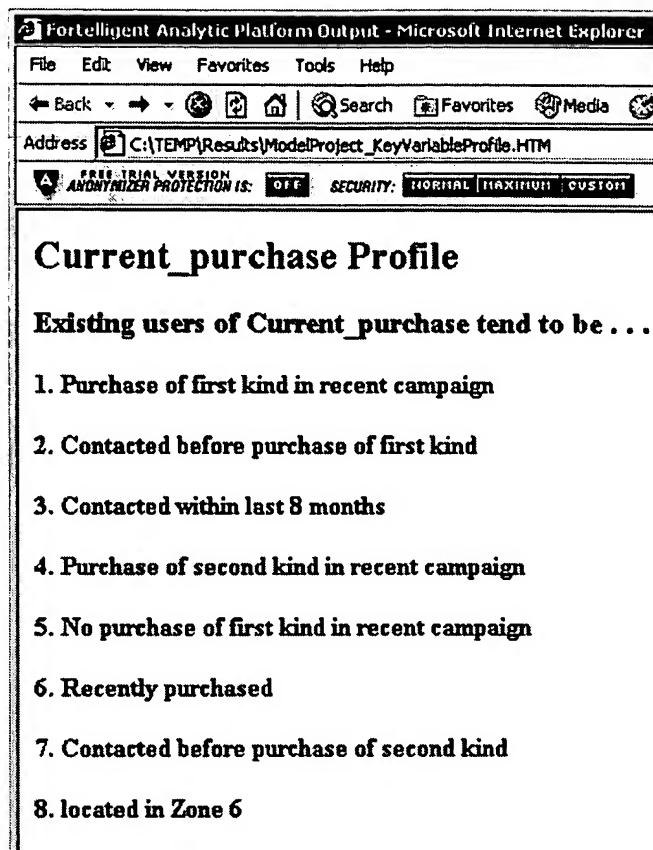


FIG. 27C

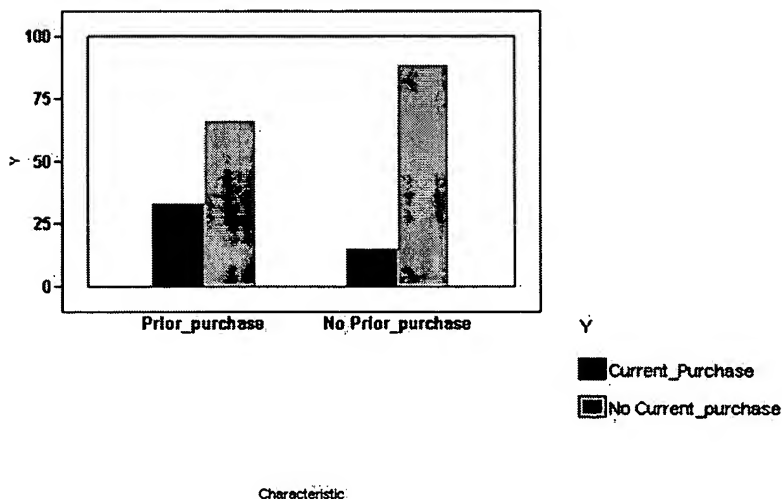


FIG. 27D